No. 200500278

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

NDSU Research Foundation

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) MAY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

BARLEY

'Stellar-ND'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this fourteenth day of February, in the year two thousand and six.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

REPRODUCE LOCALLY. *Include form number and date on all reproductions* — Form Approved - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

MAH 1-9-2006

1. NAME OF OWNER
NDSU Research Foundation

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME
ND16301

3. VARIETY NAME
'Stellar - ND'

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
C/O Executive Director
1735 NDSU Research Park Drive
PO Box 5002
Fargo, ND 58105-5002

5. TELEPHONE *(include area code)*
701-231-8931

6. FAX *(include area code)*
701-231-6661

FOR OFFICIAL USE ONLY

PVPO NUMBER
200500278

FILING DATE
June 17, 2005

7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)*
NDSU Research Foundation 501(c)(3) Corp.

8. IF INCORPORATED, GIVE STATE OF INCORPORATION

9. DATE OF INCORPORATION
May 1, 1989

10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. *(First person listed will receive all papers)*

Richard D. Horsley
Department of Plant Sciences
North Dakota Stae University
PO Box 5051
Fargo, ND 58105-5051

Dale Zetocha
NDSU Research Foundation
1735 NDSU Research Park Drive
PO Box 5002
Fargo, ND 58105-5002

FEES RECEIVED

FILING AND EXAMINATION FEES:
$ 3652.00
DATE 6/17/2005

CERTIFICATION FEE:
$ 768.00
DATE 01-20-2006

11. TELEPHONE *(Include area code)*
(701) 231-8142

12. FAX *(Include area code)*
(701) 231-8474

13. E-MAIL
richard.horsley@ndsu.edu

14. CROP KIND *(Common Name)*
Barley

16. FAMILY NAME *(Botanical)*
Poaceae

15. GENUS AND SPECIES NAME OF CROP
Hordeum vulgare

17. IS THE VARIETY A FIRST GENERATION HYBRID?
☐ YES ☑ NO

18. DOES THE VARIETY CONTAIN ANY TRANSGENES? (*OPTIONAL*)
☐ YES ☑ NO
IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERICALIZATION. _____

19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)

a. ☑ Exhibit A. Origin and Breeding History of the Variety
b. ☑ Exhibit B. Statement of Distinctness
c. ☑ Exhibit C. Objective Description of Variety
d. ☐ Exhibit D. Additional Description of the Variety *(Optional)*
e. ☑ Exhibit E. Statement of the Basis of the Owner's Ownership
f. ☑ Voucher Sample *(2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository)*
g. ☑ Filing and Examination Fee ($3,652), made payable to "Treasurer of the United States" *(Mail to the Plant Variety Protection Office)*

20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? *(See Section 83(a) of the Plant Variety Protection Act)*
☑ YES *(If "yes", answer items 21 and 22 below)* ☐ NO *(If "no", go to item 23)*

21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES?
☑ YES ☐ NO
IF YES, WHICH CLASSES? ☑ FOUNDATION ☑ REGISTERED ☑ CERTIFIED

22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☐ YES ☑ NO
IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS.
☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED
(If additional explanation is necessary, please use the space indicated on the reverse.)

23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES?
☑ YES ☐ NO
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. *(Please use space indicated on reverse.)*

24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT *(PLANT BREEDER'S RIGHT OR PATENT)*?
☑ YES ☐ NO
IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. *(Please use space indicated on reverse.)*

25. The owners declare that a viable sample of basic seed of the variety has been furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF OWNER		SIGNATURE OF OWNER	
Dale Zetocha			
NAME *(Please print or type)*		NAME *(Please print or type)*	
Dale Zetocha			
CAPACITY OR TITLE	DATE	CAPACITY OR TITLE	DATE
Executive Director NDSU Research Foundation	6/10/05		

(See reverse for instructions and information collection burden statement)

ST-470 (04-03) designed by the Plant Variety Protection Office using Word 2002.

200500278

INSTRUCTIONS

GENERAL: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be **received in** the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to **reproduce** the variety, or for tuber reproduced varieties verification that a viable *(in the sense that it will reproduce an entire plant)* tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for $3,652 ($432 filing fee and $3,220 examination fee), payable to "Treasurer of the United States" *(See Section 97.6 of the Regulations and Rules of Practice.)* Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfiled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of $432 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

Plant Variety Protection Office
Telephone: (301) 504-5518
FAX: (301) 504-5291
Homepage: http://www.ams.usda.gov/science/pvpo/pvpindex.htm

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and provide evidence that name has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: Seed Branch, AMS, USDA, 10301 Baltimore Avenue, Suite 401 NAL Building, Beltsville, MD 20705. Telephone: (301) 504-5682 http://www.ams.usda.gov/lsg/seed.htm.

ITEM

19a. Give:
(1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
(2) the details of subsequent stages of selection and multiplication;
(3) evidence of uniformity and stability; and
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified

19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:

(1) identify these varieties and state all differences objectively;
(2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
(3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.

19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.

19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, *etc.*

19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.

20. If "Yes" is specified *(seed of this variety be sold by variety name only, as a class of certified seed)*, the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. *(See Regulations and Rules of Practice, Section 97.103).*

23. *See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.*

24. *See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.*

22. CONTINUED FROM FRONT *(Please provide a statement as to the limitation and sequence of generations that may be certified.)*

23. CONTINUED FROM FRONT *(Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)*

'Stellar-ND' was first evaluated under a material transfer agreement in the United States, dated April 1, 2003. Material Transfer Agreements have been used since as well and are for testing and evaluation pruposes only. No seed sales were authorized. Release date February 10, 2005, USA.

24. CONTINUED FROM FRONT *(Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)*

'Foster' barley is a component of this variety and received Plant Variety Protection in the USA - Certificat No. 9600154 on July 31, 1998, by the NDSU Research Foundation and Plant Breeder's Rights in Canada, Certificate No. 0428 (96-771) on February 23, 1998 by the NDSU Research Foundation.

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. *(See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)*

2

EXHIBIT A - ORIGIN AND BREEDING HISTORY

'STELLAR-ND'

Spring 1994

- Original cross made at North Dakota State University (NDSU) greenhouse.
- Pedigree = Foster//ND12200/6B88-3213

- ND12200 = Bumper//Hazen/Azure
- 6B88-3213 = NDSU bulk selection/M30//Robust/3/B1602
- M30 = M18/M14
- M18 = Larker *7/Br 5750-2//M1/Dickson
- Br 5750-2 = Vantage/Jet//Vantmore/3/Br 4635-4456/4/U.M. 570
- Br 4635-4456 = old breeding line from the Agriculture Agri-Food Canada breeding program in Brandon, Manitoba of unknown parentage.
- U.M. 570 = Newal/Peatland//Montcalm
- M14 = M1/B128
- M1 = Traill/Br 5750-2
- B128 = Traill/C48-8-143-2-3-8
- C48-8-143-2-3-8 = Kindred/CIho 7177-7
- B1602 = Bumper/6B78-628//Morex/6B78-628
- 6B78-628 = Julia/3*Beacon

Summer 1994

- F_1 plants grown on NDSU research land.

Winter 1994-95

- F_2 plants grown in greenhouse near Glyndon, Minnesota.
- F_2 population number is C94-25.
- Selection of F_2 plants was based on maturity, plant height, awn type, and spike fertility.

Summer 1995

- F_3 head rows grown on NDSU research land.
- Individual F_3 families were selected. Selection of families was based on maturity, plant height, straw strength, kernel color, awn type, spike length, spike erectness, and spike density.
- Within each family, three spikes were randomly selected from different plants. Two spikes were sent to the off-season nursery near Yuma, Arizona and the third spike was stored as remnant seed in case of a crop failure at the winter nursery.
- After selection of individual spikes, the remainder of each family was harvested.

Winter 1995-96

- F_4 head rows are grown at the off-season nursery near Yuma, Arizona for seed increase.
- Grain from harvested F_3 head rows were evaluated for potential malting quality by the Department of Cereal Science (CS), NDSU. Parameters

evaluated were barley grain protein, kernel assortment, kernel color, and barley diastatic power.

Spring 1996
- Based on data from CS, selected F_4 head row C94-25-8-1 is individually harvested.
- C94-25-8-1 is given the experimental line designation ND16301.
- Seed from the F_4 row is sown in preliminary yield trials.

Summer 1996
- F_5 Preliminary Yield Trial is grown at two locations in North Dakota on NDSU research land.

Fall 1996
- Grain of "best" entries, including ND16301, is sent to the USDA-ARS Cereal Crops Research Unit, Madison, Wisconsin for malt quality evaluation. Barley and malt quality parameters evaluated include kernel plumpness and weight, barley protein, malt extract, fine-coarse malt extract difference, wort protein, β-glucan content, malt diastatic power, and α-amylase activity.
- Selection of entries sent to Madison is based on agronomic (i.e., heading date, plant height, straw strength, grain yield, etc.) and disease data.
- All entries sent to Madison are screened for net blotch and spot blotch resistance in the greenhouse by the Department of Plant Pathology, NDSU.

Spring 1997
- Based on favorable agronomic and malt quality data, ND16301 is advanced to the Intermediate Yield Trial.

Summer 1997
- F_6 Intermediate Yield Trial is grown at four locations in North Dakota on NDSU research land.

Fall 1997
- Grain of "best" entries, including ND16301, is sent to the USDA-ARS Cereal Crops Research Unit, Madison, Wisconsin for malt quality evaluation.
- Selection of entries sent to Madison is based on agronomic (i.e., heading date, plant height, straw strength, grain yield, etc.) and disease data.

Spring 1998
- Based on favorable agronomic and malt quality data, ND16301 is advanced to the Advanced Yield Trial.

Summer 1998
- F_7 Advanced Yield Trial is grown at four locations in North Dakota on NDSU research land.

Fall 1998
- Grain of "best" entries, including ND16301, is sent to the USDA-ARS Cereal Crops Research Unit, Madison, Wisconsin for malt quality evaluation.
- Selection of entries sent to Madison is based on agronomic (i.e., heading date, plant height, straw strength, grain yield, etc.) and disease data.

Spring 1999	- Based on favorable agronomic and malt quality data, ND16301 is advanced to the Varietal Yield Trial and submitted for entry in the Mississippi Valley Barley Nursery.
Summer 1999	- F_8 Varietal Yield Trial is grown at four locations in North Dakota on NDSU research land. -Mississippi Valley Barley Nursery is grown at about 15 locations each year in the Upper Midwest USA and southern Manitoba, Canada.
Fall 1999	- Grain of "best" entries, including ND16301, is sent to the USDA-ARS Cereal Crops Research Unit, Madison, Wisconsin for malt quality evaluation. - Selection of entries sent to Madison is based on agronomic (i.e., heading date, plant height, straw strength, grain yield, etc.) and disease data. - Pilot scale malting evaluation by the American Malting Barley Association, Inc. (AMBA) is conducted. The malting and brewing industry members of AMBA do pilot scale malting evaluation. Only malting quality is evaluated. Barley and malt quality parameters evaluated are similar to those evaluated by the USDA-ARS in Madison.
Spring 2000	- Based on favorable agronomic and malt quality data, ND16301 is entered in the Varietal Yield Trial and Mississippi Valley Barley Nursery, and submitted for entry in the North Dakota State Barley Varietal Yield Trial. - ND16301 was rated as unsatisfactory in its first year of AMBA Pilot Scale Evaluation due to excessive enzyme activity.
Summer 2000	- F_9 Varietal Yield Trial is grown at four locations in North Dakota on NDSU research land. - Mississippi Valley Barley Nursery is grown at about 15 locations each year in the Upper Midwest USA and southern Manitoba, Canada. - North Dakota State Barley Varietal Trial is grown at seven locations in North Dakota on NDSU research land.
Fall 2000	- Grain of "best" entries, including ND16301, is sent to the USDA-ARS Cereal Crops Research Unit, Madison, Wisconsin for malt quality evaluation. - Selection of entries sent to Madison is based on agronomic (i.e., heading date, plant height, straw strength, grain yield, etc.) and disease data. - ND16301 is submitted for the second year of AMBA Pilot Scale Evaluation is conducted by AMBA.

Spring 2001	- Based on favorable agronomic and malt quality data, 16301 is entered in the Varietal Yield Trial, the North Dakota State Varietal Yield Trial, and the Mississippi Valley Barley Nursery. - ND16301 was rated as satisfactory in its second year of AMBA Pilot Scale Evaluation.
Summer 2001	- F_{10} Varietal Yield Trial is grown at four locations in North Dakota on NDSU research land. - Mississippi Valley Barley Nursery is grown at about 15 locations each year in the Upper Midwest USA and southern Manitoba, Canada. - North Dakota State Barley Varietal Trial is grown at seven locations in North Dakota on NDSU research land.
Fall 2001	- Grain of "best" entries, including ND16301, is sent to the USDA-ARS Cereal Crops Research Unit, Madison, Wisconsin for malt quality evaluation. - Selection of entries sent to Madison is based on agronomic (i.e., heading date, plant height, straw strength, grain yield, etc.) and disease data. - ND16301 is submitted for the third year of AMBA Pilot Scale Evaluation is conducted by AMBA. - ND16301 is sown near Yuma, Arizona to increase seed for AMBA Plant Scale Evaluation.
Spring 2002	- Based on favorable agronomic and malt quality data, 16301 is entered in the Varietal Yield Trial, the North Dakota State Varietal Yield Trial, and the Mississippi Valley Barley Nursery. - ND16301 was rated as satisfactory in its third year of AMBA Pilot Scale Evaluation. - 1,000 F_{12} spikes from F_{11} plants are individually harvested from seed increase of ND16301 near Yuma, Arizona.
Summer 2002	- F_{11} Varietal Yield Trial is grown at four locations in North Dakota on NDSU research land. - Mississippi Valley Barley Nursery is grown at about 15 locations each year in the Upper Midwest USA and southern Manitoba, Canada. - North Dakota State Barley Varietal Trial is grown at seven locations in North Dakota on NDSU research land. - 1,000 F_{12} Head rows for purification are grown at Casselton, ND. -F_{12} rows with similar plant height and maturity are bulk harvested to form the breeder seed of ND16301
Fall 2002	- Grain of "best" entries, including ND16301, is sent to the USDA-ARS Cereal Crops Research Unit, Madison, Wisconsin for malt quality

evaluation.
- Selection of entries sent to Madison is based on agronomic (i.e., heading date, plant height, straw strength, grain yield, etc.) and disease data.

Spring 2003
- Based on favorable agronomic and malt quality data, 16301 is entered in the Varietal Yield Trial and the North Dakota State Varietal Yield Trial.

Summer 2003
- F_{12} Varietal Yield Trial is grown at seven locations in North Dakota on NDSU research land.
- North Dakota State Barley Varietal Trial is grown at seven locations in North Dakota on NDSU research land.
- ND16301 is sown on 600 acres in North Dakota to provide grain for the first year of AMBA Plant Scale Malting and Brewing Evaluation.
-Seed of ND16301 from bulked F_{12} head row purification is increased in Casselton, North Dakota at the Agronomy Seed Farm.

Fall 2003
- Grain of ND16301 is accepted by AMBA for the first year of Plant Scale Malting and Brewing evaluation. Plant scale evaluation entails the following. About 30,000 bushels of ND16301 grain is malted and evaluated by one member of AMBA. Malt then is distributed to two brewing members of AMBA for plant scale brewing and evaluation.

Spring 2004
- Based on favorable agronomic and malt quality data, 16301 is entered in the Varietal Yield Trial, the North Dakota State Varietal Yield Trial, and the Mississippi Valley Barley Nursery.

Summer 2004
- Varietal Yield Trial is grown at seven locations in North Dakota on NDSU research land using the purified seed increased in Casselton, North Dakota in 2003.
- North Dakota State Barley Varietal Trial is grown at seven locations in North Dakota on NDSU research land.
- Mississippi Valley Barley Nursery is grown at about 15 locations each year in the Upper Midwest USA and southern Manitoba, Canada.
- ND16301 is sown on 600 acres in North Dakota to provide grain for the second year of AMBA Plant Scale Malting and Brewing Evaluation.
-Purified seed of ND16301 is increased in Minot and Casselton, North Dakota on NDSU research land.

Fall 2004
- Grain of ND16301 is accepted by AMBA for the second year of Plant Scale Malting and Brewing evaluation.
- ND16301 was rated satisfactory in its first year of AMBA Plant Scale Malting and Brewing Evaluation.

Winter 2004-2005
- ND16301 is released as a named cultivar, Stellar-ND, on 10 February 2005.

Summer 2005
- Second year plant scale malting and brewing evaluations are being conducted by AMBA.
- Status as a "barley recommended for malting and brewing" by AMBA could be decided by late summer 2005.

Stellar-ND was observed for two generations from 2003 to 2004, and was observed to be uniform and stable within commercially acceptable limits for all traits as described in Exhibit C. Stellar-ND has been rogued in all generations subsequent to the purification in 2002. Two variants were observed. Six-rowed barley plants 4-6 inches above the canopy occur at a frequency of less than 1/10,000. Six-rowed barley plants with rough awns occur at a frequency of less than 1/100,000

The pedigree breeding method was used to develop Stellar-ND. In the early generations (i.e. F_2-F_4), highly heritable traits such as maturity, plant height, straw strength, kernel color, awn type, spike length, spike erectness, and spike density were selected. Starting at the F_5 generation, selection criteria also included agronomic (i.e., heading date, plant height, straw strength, grain yield, etc.), disease, and malt quality (i.e. protein, malt extract, wort protein, kernel plumpness, and enzyme activity) data. Based on data from multiple locations and years, Stellar-ND was selected for its high yield, strong straw, and favorable malt quality.

EXHIBIT B - NOVELTY STATEMENT

To my knowledge, Stellar-ND most nearly resembles Drummond, Excel, Foster, Hazen, Legacy, and Tradition barley. DNA analysis using polymerase chain reaction (PCR) techniques (Williams et al., 1990) with simple sequence repeat (SSR) markers (Liu et al., 1996) can easily differentiate Stellar-ND from Drummond, Excel, Foster, Hazen, Legacy, and Tradition. Using the Scottish Crop Research Institute (SCRI) (Dundee, Scotland) SSR primer pair Hvm 68, a 190 bp band found absent in Stellar-ND is found in Drummond, Excel, Foster, Hazen, Legacy, and Tradition. In addition, using the SCRI SSR primer pair Bmag 0206, a 258 bp band found in Stellar-ND is absent in the other cultivars.

Figure 1 presents a scan of a photo showing the "critical" 190 bp band produced by Hvm 68 in Drummond, Excel, Foster, Hazen, Legacy, and Tradition, but absent in Stellar-ND. Figure 2 presents a scan of a photo showing the critical 268 bp band found in Stellar-ND, but absent in Drummond, Excel, Foster, Hazen, Legacy, and Tradition. The original photos that were scanned are available upon request.

Methods

Leaf tissue was collected from Stellar-ND, Drummond, Excel, Foster, Hazen, Legacy, and Tradition barley and stored at -80 °C. DNA was extracted from the leaf tissue using the method of Kleinhofs (personnel communication, 1998). The four cultivars were screened for SSR polymorphisms using the method of Ramsay et al. (2000). Reaction conditions were as follows: 2.5 mM $MgCl_2$; 200 µM of each dATP, dCTP, dGTP, and dTTP; 5 ng of primer; 50 ng of genomic DNA; and 1.5 units Taq DNA polymerase (Promega; Madison, WI), and 1x of Taq buffer. The reaction volume was 20.0 µL. Amplification reactions were done with a Perkin-Elmer DNA thermocycler using a protocol that consists of: 1 cycle of 3 min @ 94 °C, 1 min @ 55 °C, 1 min @ 72; 30 cycles of 1 min @ 94 °C, 1 min @ 55 °C, 1 min @ 72 °C; and 1 cycle of 5 min @ 72 °C for extension. Reactions were held at 4 °C until separated in a denaturing polyacrylamide gel by electrophoresis. Bands were visualized by staining with the Promega Silver Sequence™ DNA Sequencing System (Promega; Madison, WI). Photographs of the stained gel were taken for a permanent record.

Literature Cited

Doyle, J.J., and J.L. Doyle. 1987. A rapid DNA isolation procedure for small quantities of fresh leaf tissue. Phytochemistry Bulletin 19:11-15.

Liu, Z.-W, R.M. Biyashev, M.A. Saghai Maroof. 1996. Development of simple sequence repeat DNA markers and their integration into a barley linkage map. TAG 93:869-876.

Ramsay, L., M. Macaulay, S. degli Ivanissevich, K. MacLean, L. Cardle, J. Fuller, K. J. Edwards, S. Tuvesson, M. Morgante, A. Massari, E. Maestri, N. Marmiroli, T. Sjakste, M. Ganal, W. Powell, and R. Waug. 2000. A simple sequence repeat-based linkage map of barley. Genetics 156:1997-2005.

Williams, J.G.K., A.R. Kubelik, K.J. Livak, J.A. Rafalski, and S.V. Tingey. 1990. DNA polymorphisms amplified by arbitrary primers are useful as genetic markers. Nucleic Acids Res. 18:6531-6535.

Figure 1. Denaturing polyacrylamide gel showing a 190 base pair (bp) simple sequence repeat (SSR) polymorphism using Scottish Crop Research Institute primer pair Hvm 68 that distinguishes Stellar–ND barley from Drummond, Excel, Hazen, Legacy, and Tradition barley. Band is absent in Stellar-ND but not the other cultivars. Lane code is 1=Tradition, 2=Legacy, 3=Hazen, 4=Foster, 5=Excel, 6=Drummond, and 7=Stellar-ND. Lane marker ladder is a 10 bp ladder.

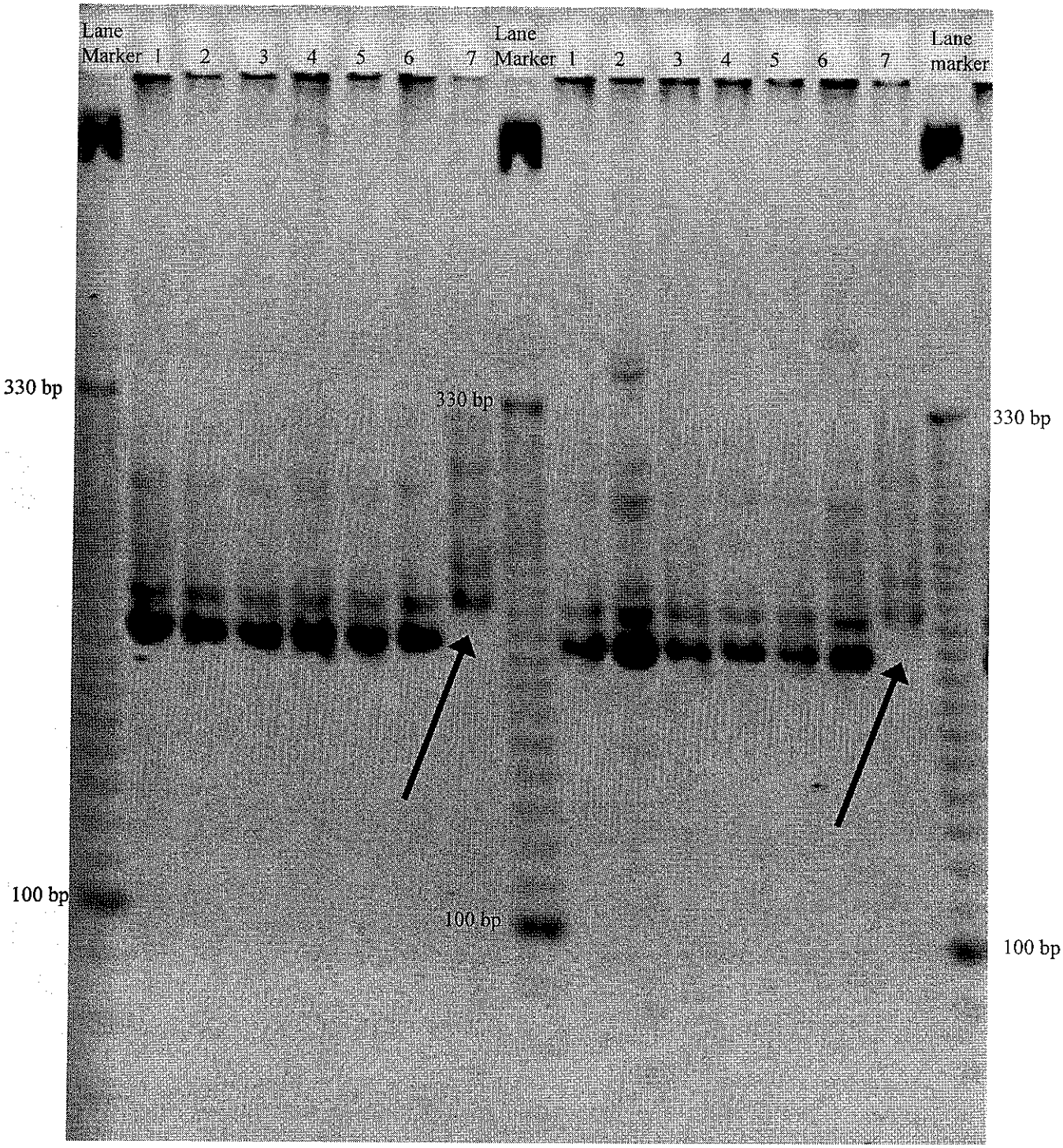
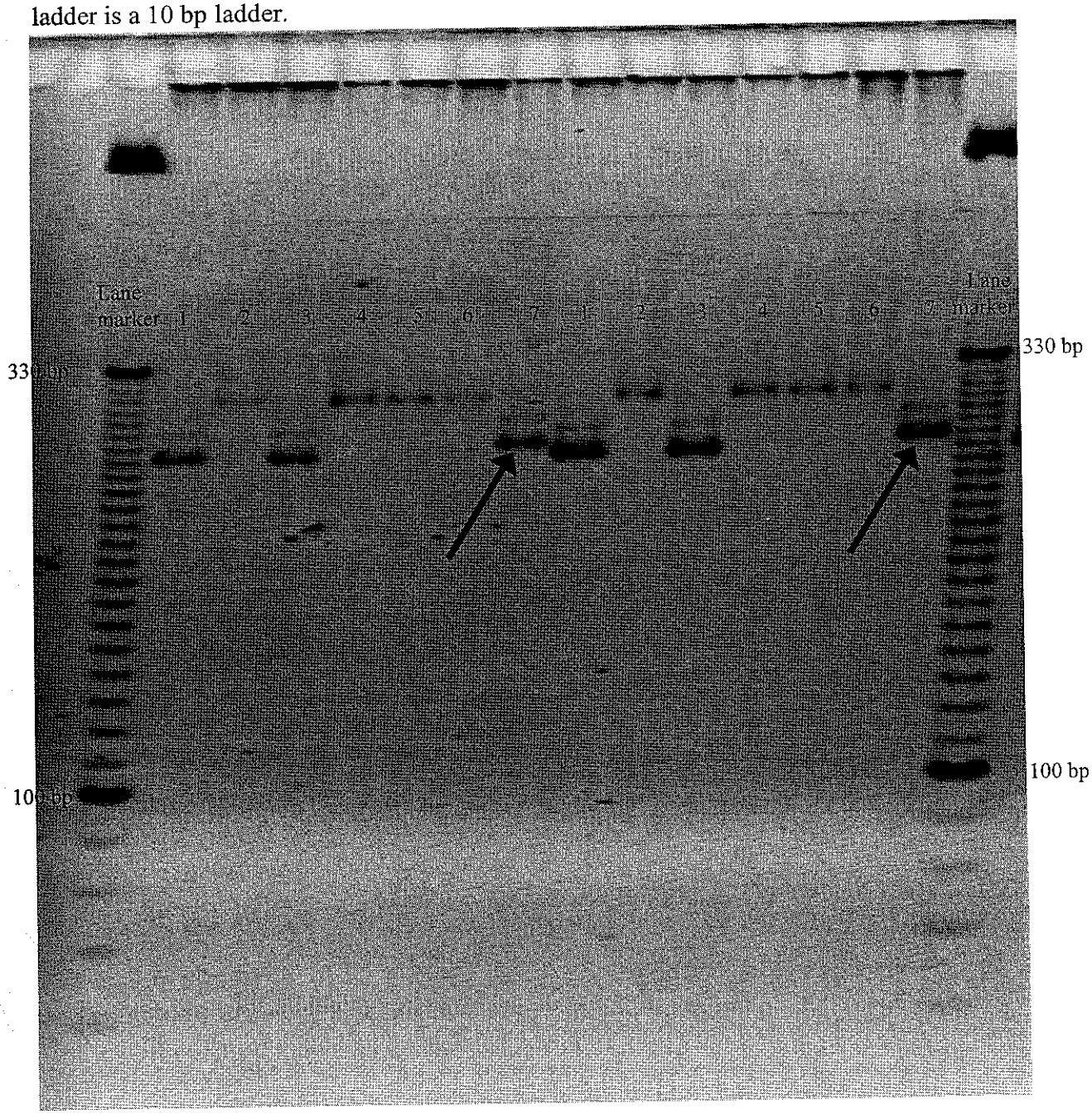


Figure 2. Denaturing polyacrylamide gel showing a 258 base pair (bp) simple sequence repeat (SSR) polymorphism using Scottish Crop Research Institute primer pair Bmag 0206 that distinguishes Stellar-ND barley from Drummond, Excel, Hazen, Legacy, and Tradition barley. Band is present in Stellar-ND but not the other cultivars. Lane code is 1=Tradition, 2=Legacy, 3=Hazen, 4=Foster, 5=Excel, 6=Drummond, and 7=Stellar-ND. Lane marker ladder is a 10 bp ladder.



U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

OBJECTIVE DESCRIPTION OF VARIETY
Barley *(Hordeum vulgare* L.)

NAME OF APPLICANT(S)	TEMPORARY OR EXPERIMENTAL DESIGNATION	VARIETY NAME
NDSU Research Foundation	ND16301	Stellar-ND

ADDRESS *(Street and No. or RD No., City, State, Zip Code, and Country)*

PO Box 5002
Fargo, ND 58105-5002

FOR OFFICIAL USE ONLY

PVPO NUMBER

200300278

PLEASE READ ALL INSTRUCTIONS CAREFULLY:

Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (i.e., [0][9][9] or [0][9]) when the number is either 99 or less or 9 or less.

1. GROWTH HABIT:

[1] 1 = Spring 2 = Facultative Winter 3 = Winter Early Growth: [ ] 1 = Prostrate 2 = Semi-Prostrate 3 = Erect

2. MATURITY: (50% Flowering)

[2] 1 = Early (California Mariout) 2 = Mid-Season (Betzes) 3 = Late (Frontier)

[-][-][-] No. Days Earlier Than _____ *

Same as Check Drummond *

[-][-][-] No. of Days Later Than _____ *

3. PLANT: (From Soil Level to Top of Head)

[2] 1 = Semi-Dwarf 2 = Short (California Mariout) 3 = Medium Tall (Betzes) 4 = Tall (Conquest)

[3] cm Shorter Than Drummond *

Same as Check _____ *

[-] cm Taller Than _____ *

4. STEM:

[2] Exsertion (Flag to Spike at Maturity): 1 = (0 – 3 cm) 2 = (3 – 10 cm) 3 = (10 – 15 cm)

[1] Anthocyanin: 1 = Absent 2 = Present

[0][5] No. of Nodes (Originating from Node Above Ground)

[1] Collar Shape: 1 = Closed 2 = V-Shaped 3 = Open 4 = Modified Closed or Open

[2] Shape of Neck: 1 = Straight 2 = Snaky 3 = Other (Specify) _____

* A commercial variety grown in the same trial.

5. LEAF:

1	Basal Leaf Sheath (Seedling): 1 = Glabrous 2 = Pubescent
1	Position of Flag Leaf (At Boot Stage): 1 = Drooping 2 = Upright
2	Waxiness: 1 = Absent (Glossy) 2 = Slightly Waxy 3 = Waxy
24	mm Width (First Leaf Below Flag Leaf)
37	cm Length (First Leaf Below Flag Leaf)
1	Anthocyanin in Leaf Sheath: 1 = Absent 2 = Present

6. HEAD:

2	Type: 1 = Two-Rowed 2 = Six-Rowed
2	Density: 1 = Lax 2 = Erect (Not Dense) 3 = Erect (Dense) 4 = Other (Specify) _____
2	Shape: 1 = Tapering 2 Strap 3 = Clavate 4 = Other (Specify) _____
2	Waxiness 1 = Absent (Glossy) 2 = Slightly Waxy 3 = Waxy
1	Lateral Kernels Overlap: 1 = None 2 = At Tip 3 = 1/4 – 1/2 of Head
3	Rachis (Hair on Edge): 1 = Lacking 2 = Few 3 = Covered

7. GLUME:

2	Length: 1 = 1/3 of Lemma 2 = 1/2 of Lemma 3 = More than 1/2 of Lemma
3	Hairs: 1 = None 2 = Short 3 = Long
4	Hair Covering: 1 = None 2 = Restricted to Middle 3 = Confined to Band 4 = Completely Covered
3	Awns: 1 = Less than Equal to Length of Glumes 2 = Equal to Length of Glumes 3 = More than Equal to Length of Glumes
2	Awn Surface: 1 = Smooth 2 = Semi-Smooth 3 = Rough

8. LEMMA:

5	Awn: 1 = Awnless 2 = Awnlets on Central Rows, Awnless on Lateral Rows 3 = Short on Central Rows, Awnlets on Lateral Rows 4 = Short (Less than Equal to Length of Spike) 5 = Long (Longer than Spike) 6 = Hooded
3	Awn Surface: 1 = Awnless 2 = Smooth 3 = Semi-Smooth 4 = Rough
3	Teeth: 1 = Absent 2 = Few 3 = Numerous
1	Hair: 1 = Absent 2 = Present
3	Shape of Base: 1 = Depression 2 = Slight Crease 3 = Transverse Crease
2	Raachilla Hairs: 1 = Short 2 = Long

9. STIGMA:

2	Hairs: 1 = Few 2 = Many

200500278

10. SEED:

[2] Type: 1 = Naked 2 = Covered

[1] Hairs on Ventral Furrow: 1 = Absent 2 = Present

[4] Length: 1 = Short (8.0 mm)
2 = Short to Mid-long (7.5 – 9.0 mm)
3 = Mid-long (8.5 – 9.5 mm)
4 = Mid-long to Long (9.0 – 10.5 mm)
5 = Long (10.0 mm)

[2] Wrinkling of Hull: 1 = Naked 2 = Slightly Wrinkled 3 = Semi-Wrinkled 4 = Wrinkled

[1] Aleurone Color: 1 = Colorless (White or Yellow) 2 = Blue

[05] Percent Abortive [35] GMS. per 1000 Seeds

11. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant, 3 = Intermediate, 4 - Tolerant)

[1]	Septoria	[1]	Net Blotch	[2]	Spot Blotch	[1]	Powdery Mildew
[1]	Loose Smut	[2]	Bacterial Blight	[1]	Covered Smut	[1]	False Loose Smut
[1]	Stem Rust	[1]	Leaf Rust	[1]	Scab	[1]	Scald
[0]	Aster Yellows Virus	[2]	BSMV	[1]	BYDV	[ ]	Other (Specify) _____

12. INSECT: (0 = Not Tested, 1 = Susceptible, 2 = Resistant, 3 = Intermediate, 4 - Tolerant)

[0]	Green Bug	[0]	English Grain Aphid	[0]	Chinch Bug	[0]	Armyworm
[0]	Grasshoppers	[0]	Cerial Leaf Beetle	[0]	Other (Specify) _____		

Hessian Fly Races

[0]	GP	[0]	A	[0]	B	[0]	C	[ ]	Other Specify)_____
[0]	D	[0]	E	[0]	F	[0]	G		

13. CHEMICAL: (0 = Not Tested, 1 = Susceptible, 2 = Resistant, 3 = Intermediate, 4 = Tolerant)

[0] DDT [ ] Other (Specify) _____

14. INDICATE WHICH VAREITY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant Tillering	Drummond	Seed Size	Drummond
Leaf Size	Drummond	Coleoptile Elongation	Drummond
Leaf Color	Drummond	Seedling Pigmentation	Drummond
Leaf Carriage	Drummond		

REFERENCES:

The following publications may be used as a reference aid for the standardization of character descriptions and terms used in this form:

1. Wiebe, G.A., and D.A. Reid, 1961, Classifications of Barley Varieties Grown in the United States and Canada in 1958, Technical Bulletin No. 1224, U.S. Department of Agriculture.
2. Reid, D.A., and G.A. Wiebe, 1968, Barley: Origin, Botany, Culture, Winter Hardiness, Genetics, Utilization, Pests, Agriculture Handbook No. 338, U.S. Department of Agriculture, pp. 61-84.
3. Malting Barley Improvement Association, Milwaukee, Wisconsin, 1971, Barley Variety Dictionary.

COLOR: Nickerson's or any recognized color fan may be used to determine color of the described variety.

200500278

EXHIBIT E - STATEMENT OF THE BASIS OF THE APPLICANT'S OWNERSHIP

Dr. Richard Horsley, an employee of the North Dakota Agricultural Experiment Station and North Dakota State University, is a plant breeder who developed 'STELLAR-ND', the six-rowed spring barley cultivar for which Plant Variety Protection is hereby sought. The employee by agreement and because of the condition of the use of the facilities and funds of the North Dakota Agricultural Experiment Station and North Dakota State University has assigned all ownership rights to 'STELLAR-ND' barley to the North Dakota Agricultural Experiment Station and North Dakota State University.

North Dakota State University on behalf of the North Dakota Agricultural Experiment Station has assigned all ownership to the NDSU Research Foundation. The NDSU Research Foundation is a nonprofit corporation set up to own and manage the intellectual property of North Dakota State University.

REPRODUCE LOCALLY. Include form number and edition date on all reproductions. FORM APPROVED - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

Application is required in order to determine if a plant variety protection certificate is to be issued *(7 U.S.C. 2421)*. The information is held confidential until the certificate is issued *(7 U.S.C. 2426)*.

1. NAME OF APPLICANT(S)	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME
NDSU Research Foundation	ND16301	'Stellar-ND'
4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP, and Country)*	**5. TELEPHONE** *(Include area code)*	**6. FAX** *(Include area code)*
C/O Executive Director PO Box 5002 1735 NDSU Research Park Drive Fargo, ND 58105-5002	(701) 231-8931	(701) 231-6661
	7. PVPO NUMBER 200500278	

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. **If no, please explain.** ☑ **YES** ☐ **NO**

9. Is the applicant (individual or company) a U.S. national or a U.S. based company? **If no, give name of country.** ☑ **YES** ☐ **NO**

10. Is the applicant the original owner? ☐ **YES** ☑ **NO** **If no, please answer one of the following:**

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?
☑ **YES** ☐ **NO** **If no, give name of country**

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?
☐ **YES** ☐ **NO** **If no, give name of country**

11. Additional explanation on ownership *(Trace ownership from original breeder to current owner. Use the reverse for extra space if needed)*:

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.